THE MINERAL INDUSTRY OF

TANZANIA

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In recent years, the mineral industry of Tanzania has produced copper, gold, silver, and semimanufactured steel and such industrial minerals as calcite, diamond and other gemstones, gypsum, phosphate rock, salt, silica sand, and soda ash. The country has also produced coal, petroleum products, and such building materials as cement, gravel, limestone, and sand. Deposits of cobalt, copper, iron ore, natural gas, nickel, and titanium also occur.

In 2002, Tanzania's gross domestic product (GDP) at purchasing power parity amounted to $24.2 billion. The GDP grew by 6.3% in 2002 compared with 6.1% in 2001, 5.6% in 2000, and 3.7% in 1999. Manufacturing accounted for 8.4% of GDP; construction, 5%; mining and quarrying, 2.7%; and electricity and water, 1.6% (International Monetary Fund, 2003, p. 180; 2003§[1]).

After increasing by 13.1% in 2001, the value of output in the mining sector rose by 16.3% in 2002. From 1997 to 2002, the value of output in the mining sector grew by an average of 15.8% per year because of substantial increases in diamond and gold production (table 1). During the same period, the value of output in the construction and electricity and water sectors rose by averages of 9.5% and 3.7%, respectively (National Bureau of Statistics, 2003).

Trade

In recent years, Tanzania's mineral exports have risen substantially. Most of the increase was attributable to gold exports, which amounted to $335.4 million in 2002; gold accounted for 35% of total exports. Diamond exports were $22.1 million, and other mineral exports, $21.4 million. Total mineral exports increased to $378.9 million in 2002 from $51.1 million in 1997. During the same period, the share of total exports attributable to minerals increased to 40% in 2002 from 7% in 1997 (Bank of Tanzania, 2002, p. 9; 2003a, p. 69; 2003b, p. 39; 2003c, p. 33).

The Bank of Tanzania (2002, p. 10; 2003a, p. 71; 2003b, p. 40; 2003c, p. 35) reported that imports of fertilizers amounted to $18.2 million in 2002 compared with $15.5 million in 2001 and $22.6 million in 1997. Imports of petroleum products were $174.9 million in 2002. Petroleum products accounted for nearly 11% of total imports, and fertilizers, 1%.

Commodity Review

Metals

Aluminum and Zinc.—Tanzania produced small amounts of aluminum products. Imports of refined zinc increased to 4,570 metric tons (t) in 2001 from 3,848 t in 2000 and 2,447 t in 1998. Aluminum and zinc were used by Aluminum Africa Ltd. (ALAF) for galvanizing sheet steel (Kenge, 2003a§; British Geological Survey, written commun., 2002).

Cobalt, Copper, and Nickel.—In 2002, copper production increased to 2,700 t from 2,645 t in 2001 (table 1). Barrick Gold Corp. produced copper as a coproduct at the Bulyanhulu gold mine. In 2002, Barrick conducted a scoping study on the Kabanga nickel sulfide deposit in northwestern Tanzania. At the end of 2001, resources at Kabanga were reported to be 600,000 t of contained nickel; Barrick expanded the resources in 2002. Kabanga also had resources of cobalt and copper (Barrick Gold Corp., 2002, p. 37; 2003, p. 32).

Goldstream Mining NL of Australia explored for cobalt, copper, and nickel at the Mibango and Wansisi Regional Projects near Lake Tanganyika and at the Luwumbu Project near Lake Malawi. The company planned further exploration work on these projects in 2003 (Goldstream Mining NL, 2003).

Gold.—In 2002, Tanzania's gold production increased to about 37,000 kilograms (kg) from 30,088 kg in 2001and 15,060 kg in 2000. Tanzania became the fourth largest gold producer in Africa in 2001. The Bulyanhulu, Geita, Golden Pride, and North Mara Mines had the capacity to produce about 50,200 kilograms per year (kg/yr) of gold. Tanzania's resources amounted to nearly 1,400 t of contained gold, of which about 780 t was reserves (tables 1-3).

In 2002, the Geita open pit gold mine produced 18,010 kg of gold from 4.98 million metric tons (Mt) of ore, which was an increase from 16,969 kg of gold from 4.52 Mt of ore in 2001. Geita Gold Mines, which was owned by Anglogold Ltd. (50%) and Ashanti Goldfields Co. Ltd. (50%), started production in 2000. The gold recovery rate fell to 92% in 2002 from 93% in 2001; cash costs rose to $163 per ounce of gold from $143 per ounce (Ashanti Goldfields Co. Ltd., 2003, p. 20).

The ore treatment capacity at Geita rose to 5.6 million metric tons per year (Mt/yr) in 2002 from 4 Mt/yr in 2001; further increases to 7 Mt/yr of ore were being considered. Gold production was expected to increase to more than 18,700 kg in 2003; the life of the

[1] References that include a section mark (§) are found in the Internet References Cited section.

mine was about 15 years. Cash costs were likely to rise to about $180 per ounce of gold in early 2003 because of lower ore grades. In the second half of the year, cash costs were expected to fall from $150 to $160 per ounce as ore grades increase (Tassell, 2003a, b).

Geita Gold Mines spent from $5 million to $6 million per year on exploration. At the end of 2002, the company had increased reserves to 70.4 Mt at a grade of 4.2 grams per ton (g/t) gold (296 t of contained gold), which was an increase of more than 20% compared with that of 2001. Ashanti also continued a regional assessment of the gold fields near Lake Victoria and was granted the Kigosi license by the end of 2002 (Ashanti Goldfields Co. Ltd., 2003, p. 22).

Kahama Mining Corp. Ltd. (KMC) (100% owned by Barrick) operated the Bulyanhulu underground gold mine. In 2002, the Bulyanhulu Mine produced 11,083 kg of gold from nearly 1.08 Mt of ore, which was an increase from 7,527 kg of gold from 778,000 t of ore in 2001. Cash costs were $198 per ounce of gold in 2002 (Barrick Gold Corp., 2003, p. 31-32). KMC also produced copper and silver as coproducts. The majority of gold was recovered from copper concentrates; the remainder was from gold doré.

In 2003, Barrick planned to increase production to 12,900 kg; cash costs were expected to fall to $175 per ounce of gold. The company planned to raise production to between 13,400 and 17,700 kg/yr at a rate of an average cash cost of $151 per ounce of gold during the expected 21-year life of the mine (Tassell, 2003b).

Barrick also held the Golden Ridge, Chocolate Reef, and Tulawaka properties, which contained gold resources of 68 t, 59 t, and 26 t, respectively (table 3). In spite of the greater resources of gold at Golden Ridge and Chocolate Reef, Barrick focused on the Tulawaka property because of its higher grade.

The Tulawaka project was a joint venture with Explorations Minieres du Nord Ltée (MDN). In 2002, Barrick and MDN carried out engineering studies and exploration at Tulawaka. The feasibility study on the East Zone was nearly completed at yearend; a development decision was expected in the first half of 2003. If the results of the study were favorable, then a mine would be built at a cost of $31 million. The processing plant would treat about 1,000 metric tons per day of ore (Barrick Gold Corp., 2003, p. 32; Tassell, 2003b).

Resolute Mining Ltd. of Australia owned the Golden Pride open pit mine. In 2002, the Golden Pride Mine produced 4,625 kg of gold from 2 Mt of ore compared with 5,289 kg of gold from 1.84 Mt of ore in 2001. Production was limited by lower grades of ore and instability of the pit wall. Gold recovery rates fell to 89% in the fourth quarter of 2002 from 93% in the first quarter (Resolute Mining Ltd., 2001, 2002b, c, 2003).

In October 2002, Resolute upgraded the ore-treatment capacity of the Golden Pride Mine to 2.6 Mt/yr from 1.65 Mt/yr. From 2003 to 2008, Resolute planned to produce nearly 5,300 kg/yr of gold at a cash cost of $220 per ounce of gold. The company also planned further exploration work at Golden Pride in 2003 to extend the life of the mine (Resolute Mining, 2003; Tassell, 2003b).

In 2002, Resolute signed a joint-venture agreement with Spinifex Gold Ltd. on the Nyakafuru project. Nyakafuru had resources of about 3.6 Mt at a grade of 6.3 g/t gold (23 t of contained gold). Resolute explored at Nyakafuru with an emphasis on the Kanegele property. Spinifex completed structural geology assessments at the Buckreef/Rwamagaza and Kitongo projects, which had resources of 22 t and 17 t of contained gold, respectively. Spinifex planned further exploration at Buckreef/Rwamagaza in 2003. Other properties held by Spinifex included Majimoto South and Nyangombe (tables 1, 3; Spinifex Gold Ltd., 2002a, p. 10, 55; 2002b).

Resolute also signed joint-venture agreements with Sub-Sahara Resources NL of Australia. The Nyakafuru joint venture consisted of the Kangele East, Mwagi Magi North, Mwagi Magi South, and Mwenki licenses. The Kahama joint venture consisted of the Igusulu 1, Igusulu 2, Ishiki, Kisasiga, Kwimba, Mumba 1, and Mumba 2 licenses. Sub-Sahara completed a drilling program at its Nyanzaga project in 2002; the company also explored at Jubilee Reefs. Other projects held by Sub-Sahara included the Kwimba, Mabale, and Nyamirembe licenses (African Mining, 2002; Sub-Sahara Resources NL, 2002, p. 5, 7-9).

East African Gold Mines Ltd. (EAGM) started production at the North Mara open pit gold mine in the third quarter of 2002. The North Mara project encompassed the Gokona, Nyabigena, and Nyabirama pits. Production in 2002 amounted to 1,914 kg of gold from 814,000 t of ore; the gold recovery rate was 94% in the fourth quarter. EAGM planned to produce nearly 6,700 kg/yr of gold from 2 Mt/yr of ore. The mine was expected to have a life of 10 years with operating costs of $200 per ounce (Lion Selection Group, 2002, 2003; Tassell, 2003b).

At the end of 2002, estimated resources at North Mara had increased to 44.5 Mt at a grade of 3 g/t gold from 41 Mt at a grade of 2.9 g/t. Reserves increased to 24.6 Mt at a grade of 3.7 g/t from 21.6 Mt at a grade of 3.5 g/t (table 3). EAGM planned further exploration in 2003 at North Mara and other properties that included Dett, Gokona, and Nyabigena North (Lion Selection Group, 2003).

Meremeta Ltd. held a 70% interest in the Buhemba prospecting license, which included the Buhemba, Buhemba South, Kilamongo, Magunga, and Mwizi deposits. These deposits had a combined resource of 11.4 Mt at a grade of 2 g/t gold (Resource Information Unit, 2001, p. 281-282). The company also bought and exported gold produced by small-scale miners and rented out mining and processing equipment to the miners. In 2001 (the latest year for which data were available), Meremeta's exports fell to 139 kg from 415 kg in 2000.

In December 2002, Lakota Resources Inc. of Canada reported that it had acquired a 100% interest in the Ikina Reefs licenses near the Bulyanhulu Mine. Lakota purchased the licenses from Spinifex and Sub-Sahara. Although an estimate of resources has not been made, local artisanal miners were known to produce gold at Ikina Reefs (African Mining Bulletin, 2002a). Other properties held by Lakota included Bemuda, Ikina South, Ikungu, Shirera/Wandu, Siaga Hill, and Tannor.

In 2002, African Eagle Resources plc (known as Twigg Minerals plc until 2001) engaged in exploration and purchased new licenses at Miyabi. Gold Fields Ltd. had an option to form a joint venture for the Miyabi project with African Eagle. Further drilling was planned for Miyabi in mid-2003 to enlarge the resource. The company also explored at its Kakumbi and Msasa properties. African Eagle dropped its interest in the Nikonga and Nyamalimbe properties in 2002 (African Eagle Resources plc, 2003, p. 2, 4-5).

Tan Range Exploration Corp. of Canada took over Tanzania American International Development Corp. 2000 Ltd. (Tanzam). After acquiring Tanzam, Tan Range held more than 70 properties in Tanzania, some of which were joint ventures with Barrick. The company was awarded an exploration license near Kigosi in 2002. It also explored for gold at Lunguya, which was near the Bulyanhulu Mine (African Mining Bulletin, 2002b, c).

In 2002, International Gold Exploration AB of Sweden resumed discussions with the Government about participating in the development of a small-scale gold mine. Mincor Resources of Australia signed an agreement with Barrick for the Imweru property. Barrick would have a period of 4 years to explore at Imweru after which it could purchase 100% of the project. Imweru was Mincor's last remaining property in Africa. Conquest Resources Ltd. held the Suguti property. Randgold Resources Ltd. planned to explore for gold in 2003 (Africa Mining Intelligence, 2002; International Gold Exploration AB, 2003, p. 8; Randgold Resources Ltd., 2003, p. 57).

Iron and Steel.—Tanzania produced iron ore from the Itewe deposit near Chunya until 1997. Other iron ore deposits were found at Liganga and in the Uluguru Mountains. The state-owned National Development Corp. (NDC) was seeking investors to help develop the Liganga Iron and Steel Project. Implementation has been delayed by a lack of funds to conduct feasibility studies, high variability in resource estimates, poor infrastructure, and power requirements of at least 200 megawatts (MW). The development of Liganga depended upon the success of the Mchuchuma coal mine (Mushi 2002§; Mwakisyala 2002§).

National production of rolled steel increased to 25,418 t in 2002 from 16,340 t in 2001 and 12,498 t in 1997. In 2002, Simba Steels raised $4 million to build a new rolling mill in Dar es Salaam that would manufacture long products (Metal Bulletin, 2002; National Bureau of Statistics, 2003). Other producers of steel products included MM Steel Co. Ltd. and SITA Rollings Ltd.

ALAF operated a 40,000-t/yr-capacity plant for galvanizing sheet. In 2002, ALAF increased production to 30,000 t from 23,000 t in 2001 and planned to increase output to 33,000 t in 2003. Jeje Industries Ltd. also planned to develop a plant for galvanizing sheet steel (United Nations Industrial Development Organization, 2003; Kenge, 2003§a).

The International Iron and Steel Institute (2002, p. 81, 85) estimated that Tanzania's imports of semimanufactured and finished steel products amounted to 121,000 t in 2001 compared with 69,000 t in 2000 and 35,000 t in 1996. From 1996 to 2001, Tanzania's apparent consumption of crude steel rose to 135,000 t from 39,000 t.

Platinum-Group Metals.—In 2002, Goldstream Mining NL explored for platinum-group metals (PGM) at the Mibango and Wansisi projects near Lake Tanganyika and at the Luwumbu project near Lake Malawi. In 2002, Goldstream signed a joint-venture agreement with Lonmin plc for the Mibango project that included further exploration work and a feasibility study. Goldstream planned further exploration work at Luwumbu and Wansisi in 2003. African Eagle explored for PGM at Zanzui in the Lake Victoria gold field (African Eagle Resources plc, 2003, p. 4; Goldstream Mining NL, 2003).

Silver.—Tanzania produced silver as a coproduct of gold mining and refining. Domestic output of silver increased to 8,620 kg in 2002 from 6,861 kg in 2001. Concentrates from the Bulyanhulu Mine that contained copper, gold, and silver were shipped to Japan for refining. Silver was also contained in the gold doré produced at Bulyanhulu (President's Office for Planning and Privatization, 2003§).

Titanium, Vanadium, and Zirconium.—Deposits of heavy-mineral sands, which contain ilmenite, rutile, and zircon, were found at Bagamayo and Msimbati. The Liganga iron ore deposit was reported to have resources of titanium and vanadium. NDC's investment plans for the Liganga Iron and Steel Project included the possibility of processing titanium and vanadium concentrates for export (Mwakisyala 2002§).

Industrial Minerals

Cement.—In 2002, Tanzania's production of cement increased to nearly 1.03 Mt from 900,000 t in 2001 and 621,000 t in 1997 because of gold mine development, infrastructure works, and large construction projects (National Bureau of Statistics, 2003). Tanzania's three cement producers were Mbeya Cement Co. Ltd., Tanga Cement Co. Ltd., and Tanzanian Portland Cement Co. Ltd (TPCC), which had a total cement production capacity of 1.25 Mt/yr and a total clinker production capacity of 1.55 Mt/yr (table 2).

TPCC produced 500,000 t of cement in 2002. By September 2004, TPCC planned to increase its capacity to as much as 700,000 t/yr from 500,000 t/yr. Mbeya Cement produced about 200,000 t of cement in 2001; the company exported cement to Burundi, Malawi, Rwanda, and Zambia (Mwamunyange, 2002§; Kenge, 2003§b).

From 1997 to 2002, Tanzania's cement consumption increased to nearly 1.14 Mt from 524,000 t. During the same period, exports fell to 37,000 t from 100,000 t, and imports rose to 149,000 t from 2,800 t. Tanzania's exports have been inhibited by high power costs, poor infrastructure, and tariffs imposed by the Common Market for Eastern and Southern Africa (National Bureau of Statistics, 2003; Mwamunyange, 2002§).

Diamond.—In 2002, national diamond production amounted to 213,491 carats compared with 254,271 carats in 2001 and 123,090 carats in 1997. Exports fell to 183,406 carats in 2002 from 260,419 carats in 2001. The decline in production and exports in 2002 was attributable to decreased recovery at the Williamson Mine, which was operated by the DeBeers Group. Diamond recovery at the Williamson Mine fell to 152,234 carats in 2002 from 190,634 carats in 2001. Ore processed increased to nearly 3.33 Mt in 2002 from

2.87 Mt in 2001, but the grade of the ore fell to 4.6 carats per 100 t from 6.7 carats per 100 t (DeBeers Group, 2003, p. 41; National Bureau of Statistics, 2003). The entire output of the mine was exported to the United Kingdom.

In October 2002, DeBeers commissioned a new plant with a capacity of 4.26 Mt/yr to treat mine tailings. In 2003, the company expected to produce about 300,000 carats of diamond. The company planned to produce from 300,000 to 400,000 carats per year during the remaining life of the mine, which was expected to be at least 10 years (Tassell, 2003c).

About 3,000 artisanal miners were estimated to be working in the vicinity of the Williamson Mine. The miners worked alluvial deposits of diamond that resulted from the erosion of the local kimberlites.

Gemstones.—In 2002, the total production of gemstones rose to 113,142 kg from 96,866 kg in 2001. The value of gemstone exports, however, fell to about $8.4 million in 2002 from nearly $19 million in 2001 because of declining production and prices for tanzanite (Tanzania Chamber of Mines, undated§).

From 1998 to 2001, tanzanite accounted for 80% of the value of Tanzania's gemstone exports. In 2001, the officially reported production of tanzanite fell to 5,473 kg from 5,516 kg in 2000. The value of tanzanite produced in 2001 amounted to $15.93 million (S.S. Salim, Ministry of Energy and Minerals, written commun., September 17, 2002).

In 2002, the production and price of tanzanite fell because of false allegations that supporters of the al-Qaeda terror network were buying tanzanite in Tanzania and smuggling it to Dubai and Hong Kong for sale. The demand for tanzanite, which was already weakened by the recession in the United States, fell further as a result. According to the U.S. State Department, evidence to suggest that sales of tanzanite were funding al-Qaeda was lacking. Tiffany & Co. and Zale Corp. ended their boycott of tanzanite in 2002; QVC Inc. was expected to restart promoting tanzanite in 2003 (Business Times Market & Economy, 2002; Henricus, 2003).

In February 2002, the allegations regarding ties to terrorism led the Arusha Regional Miners Association, the Government of Tanzania, the Tanzania Mineral Dealers Association, the Tanzanian Chamber of Mines, and gemstone and jewelry trade associations from India and the United States to establish the Tucson Tanzanite Protocol. The interested parties agreed to establish a system of warranties to certify that tanzanite bought, cut, polished, set, sold, or otherwise traded came from legitimate sources. They also committed to strengthen and maintain a system of control, oversight, and law enforcement for the movement of tanzanite from the mines to the point of initial export (American Gem Trade Association, 2002).

African Gem Resources Ltd. (Afgem) held the rights to mine for tanzanite in Block C of the Merelani mining area near Arusha. Afgem was producing 1,000 metric tons per month (t/mo) of ore at a grade of 12.83 g/t tanzanite in early 2002. The company planned to raise production to more than 4,000 t/mo of ore at a grade of 15 g/t tanzanite. The highest quality tanzanite mined by Afgem was cut at its lapidaries in South Africa and Tanzania; the remainder was sold locally to licensed dealers (Tassell, 2002).

Kilimanjaro Resources mined tanzanite in Block A. Blocks B and D of the Merelani deposit were being mined by 5,000 to 10,000 artisanal miners, who accounted for most of the country's tanzanite production. Most of the tanzanite produced in Blocks B and D has been smuggled out of the country in recent years (Henricus, 2003; Tassell, 2002).

Rhodolite and tsavorite garnet were found at numerous locations in Tanzania. Tsavorite, which is a green grossular garnet that obtains its color from trace amounts of chromium and vanadium, was found near Arusha, Lemshuku, Namungo, and Tunduru. In 2001, the production of garnet amounted to 19,508 kg at a value of $1.01 million. Garnet production was estimated to be 23,000 kg in 2002 (S.S. Salim, Ministry of Energy and Minerals, written commun., September 17, 2002).

Ruby was produced at the Mundurara Mine and other mines near Longido in the Arusha Region. Other ruby mines were located in the Morogoro and Tanga Regions. In 2001, ruby output increased to 1,174 kg from 1,070 kg in 2000. The value of ruby production amounted to $71,000 in 2001. Ruby production was estimated to be 1,500 kg in 2002 (S.S. Salim, Ministry of Energy and Minerals, written commun., September 17, 2002).

Sapphire was produced at Muheza and the Umba River in the Tanga Region, Kitali, Songea and Tunduru in the Ruvuma Region, and Liwale in the Lindi Region. The production of sapphire increased to 3,576 kg in 2001 from 2,531 kg in 2000; the value of sapphire output amounted to $490,000. Sapphire production was estimated to be 4,200 kg in 2002 (S.S. Salim, Ministry of Energy and Minerals, written commun., September 17, 2002).

Great Southern Ruby Pty. Ltd. of Australia explored for ruby and sapphire at its Songea Project; the company spent nearly $650,000 on exploration in 2002. Small amounts of primary ruby and sapphire were found at the Songea Project; most of the resources, however, were alluvial. The resources of the Mbeya Prospect in Songea North were estimated to be from 1 million to 2.5 million cubic meters at a grade of about 40 grams per cubic meter, of which 14% was ruby, and 86%, sapphire. Other prospects in Songea North were estimated to have resources of 30,000 cubic meters at a grade of about 40 grams per cubic meter. Great Southern Ruby also explored at Songea South (Great Southern Ruby Pty. Ltd., undated a§, b§).

In December 2002, Great Southern Enterprises Corp. (known as Caesars Explorations Inc. until November 2002) of Canada sold its interests in Pacific Mining Corporation Ltd. Pty. to Canafra Mineral Exploration Corp. Pacific Mining held the Liparamba, Matemango, and Muhuwesi gemstone concessions in the Tunduru District, where garnet, ruby, and sapphire were discovered.

Antwerp Crystal Ltd. produced small amounts of aquamarine at Chengena and sapphire at Kitali. The company planned to mechanize its mining operations and to increase sapphire and aquamarine capacity to 750 kg/yr and 75 kg/yr, respectively. Antwerp also planned to establish a lapidary. The estimated total cost of the project was $640,000 (United Nations Industrial Development Organization, 2003).

In 2001 and 2002, an estimated total of 1,000 kg of aquamarine was mined from a deposit in the Songea area. Most of the rough aquamarine recovered was exported to Germany for cutting. The deposit was depleted in 2002 (Laurs, 2002).

Lime.—Athi River Mining Ltd. of Kenya constructed a lime plant in Tanzania that was expected to start production in July 2003. The Geita Mine used small amounts of imported lime. Highland Building Products Ltd. planned to manufacture lime for domestic use in construction, gold mines, and sugar factories (Athi River Mining Ltd., 2003, p. 3, 16; United Nations Industrial Development Organization, 2003).

Salt.—Tanzania's salt production amounted to 65,650 t in 2002 compared with 65,000 t in 2001 and 72,511 t in 1997. Ruchugi Salt Works Co. Ltd. was seeking funds to expand and modernize its operations. The company planned to increase its capacity to 30,000 t/yr from 8,000 t/yr (United Nations Industrial Development Organization, 2003).

Silica.—High-quality silica sands were located near Bukoba, which is a port on Lake Victoria; silica sands were also found at Pugu. Kioo Ltd. operated a plant in Dar es Salaam that produced glass bottles and containers. The company exported 80% of its production, mostly to countries in eastern and southern Africa. In July 2002, Kioo announced plans to invest $2 million to purchase new equipment and to increase efficiency. Production was expected to rise to nearly 55,000 t/yr from 40,000 t/yr (Kenge, 2002§).

Stone, Crushed.—The Tanga and Wazo Hill limestone deposits have been developed for use in the cement industry; other substantial limestone deposits include Lindi. During a visit in February 2002, the author observed numerous small-scale crushed stone operations in rural areas that used labor-intensive production processes.

The production of crushed limestone fell to about 1.54 Mt in 2002 from 2.27 Mt in 2001. The output of pozzolanic materials was 43,268 t in 2002 compared with 41,468 t in 2001 and 57,014 t in 2000. About 130,000 t/yr of aggregate was used as backfill in the Bulyanhulu underground mine. According to official statistics, about 108,000 t/yr of stone and aggregate were produced in the area of Dar es Salaam; other estimates run as high as three times this figure. The extraction of coral, limestone, and sand has caused damage to the environment, infrastructure, and local residences through the diversion of streams and rivers (Menda, 2002).

Mineral Fuels

Coal.—The Kiriwa coalfield produced small amounts of bituminous coal, most of which were consumed at a powerplant near the mine. Bituminous coal deposits in the Ruhuhu coalfield included the Ketewaka, Mbalawala, Mbuyura, and Mchuchuma; other bituminous coalfields included the Gahula and Njuga. The largest sub-bituminous coalfields were the Mhukuru and Ufipa. In 2002, Tanzania's coal production increased to 78,980 t from 77,789 t in 2001 and 28,448 t in 1997 (S.S. Salim, Ministry of Energy and Minerals, written commun., September 17, 2002).

In 2002, NDC formed a joint venture with Cinergy Global Power Inc., Grinaker-LTA, and Siemens Ltd. to develop the Mchuchuma deposit. Resources at Mchuchuma were estimated to be 536 Mt. A surface mine with a capacity of 1.5 Mt/yr and a coal-fired powerplant with a capacity of 400 MW were planned. The mine was expected to be commissioned in 2006 or 2007; development of the mine would start in late 2003. Costs for the project were estimated to be $600 million (Mwakisyala, 2002§).

Natural Gas.— AES Corp. of the United States, PanOcean Energy Corp. Ltd., and the state-owned Tanzania Electric Supply Company Ltd. (TANESCO) planned to develop the natural gas resources at Songo Songo Island. The project would deliver natural gas from the Songo Songo field to the Ubungo powerplant in Dar es Salaam, which was operated by TANESCO, and to TPCC's cement plant at Wazo Hill. Kioo Glass and Kisarawe Brick Factory were also expected to consume gas from Songo Songo. The project would involve installing a gas-processing plant on Songo Songo Island with a capacity of about 720 million cubic meters per year, constructing 258 kilometers (km) of pipeline to Dar es Salaam and Wazo Hill, and converting the 112-MW Ubungo plant from diesel to natural gas. PanOcean expected the project to be completed in 2004 (World Bank Group, 2001b, p. 2; PanOcean Energy Corp. Ltd., 2003, p. 17-18).

Petroleum.—Production at Tanzania's only petroleum refinery declined every year from 1995 to 2000 before shutting down because of outdated technology and high transportation costs (National Bureau of Statistics, 2003). The country depended upon imports for its petroleum requirements.

In 2002, Antrim Energy Ltd. negotiated the drilling of three wells on the Pemba-Zanzibar offshore block and a new production-sharing agreement (PSA) with the Government. Aminex plc planned to drill two exploratory wells on the Nyuni offshore field concessions. The company sought partners to share exploration costs on its concessions that covered 112,000 square kilometers (km^2). Tanzania Petroleum Development Corp. put 12 exploration blocks out to tender; the Royal Dutch/Shell Group won concessions 9, 10, 11, and 12 in September. The concessions won by Royal Dutch/Shell covered 35,400 km^2 to the west of Pemba and Zanzibar. The company started negotiating a PSA with the Government. Other companies seeking PSAs included Petrobras Group of Brazil and Maurel & Prom of France (Africa Energy Intelligence, 2002a-c).

Infrastructure

In 2002, TANESCO had powerplants with a combined capacity of 763 MW in its grid network, of which 561 MW was hydroelectric, and 202 MW, thermal. Hydroelectric power stations included Kidatu, with a capacity of 204 MW; Kihansi, 180 MW; Mtera, 80 MW; Pangani Falls, 68 MW; and Hale, 21 MW. In addition to the plants in the grid network, 55 isolated minihydroelectric generators supplied 23 MW of capacity. Independent Power Tanzania Ltd. operated the 100-MW Tegeta diesel powerplant, which

was also connected to the grid. Production started at Tegeta in January 2002. The Geita Mine had its own isolated powerplant with a capacity of 39 MW; demand was 23 MW of capacity (Business Council for Sustainable Energy, 2003, p. 108; Tassell, 2003a).

In 2002, Tanzania's electricity production rose to 2,790 gigawatthours (GWh) from 2,663 GWh in 2001 and 1,894 GWh in 1997. Losses in transmission amounted to 714 GWh. Hydroelectric plants accounted for more than 97% of national power production. Production from thermal plants in the power grid has been highly volatile in recent years; most of the plants were shut down in 2002 (National Bureau of Statistics, 2003).

The consumption of electricity rose to 2,076 GWh in 2002 from 2,015 GWh in 2001 and 1,750 GWh in 1997. The peak grid-based demand for electricity amounted to 465 MW of capacity. TANESCO estimated that the consumption of electricity would rise to 13,360 GWh in 2025. Peak demand would rise to more than 800 MW of capacity in 2005 and 2,312 MW in 2025. Demand from gold mines was expected to grow to more than 100 MW of capacity (Business Council for Sustainable Energy, 2003, p. 109; National Bureau of Statistics, 2003).

TANESCO's Power Sector Master Plan proposed the addition of 1,440 MW of new capacity by 2021. The company planned to build new gas-fired powerplants and substitute natural gas for diesel in other plants. In addition to the Songo Songo project, the Power Sector Master Plan also included the conversion of the 100-MW Tegeta powerplant to natural gas and the addition of 150 MW of new gas-fired capacity from 2003 to 2005. Other proposals included the Ruamakali and Ruhudji hydroelectric projects (Business Council for Sustainable Energy, 2003, p. 108-109; World Bank Group, 2001b, p. 4-5).

Out of the country's rural population, which was about 85% of the total population, less than 1% had access to electricity. Most rural energy requirements were supplied by charcoal. To alleviate the resulting environmental problems from deforestation, TANESCO promoted rural electrification and the development of renewable energy (Business Council for Sustainable Energy, 2003, p. 111).

Geothermal areas in Tanzania include Arusha, Mbeya, and Rufiji. Most exploration for geothermal energy sources has been very preliminary because of abundant hydropower and plans to develop domestic coal and natural gas resources. The Government, however, was planning an exploration program for Arusha and Mbeya that would include an evaluation of geothermal energy sources and a feasibility study. First Energy Company Ltd. of Tanzania held an exploration license for geothermal energy in the Rufiji district. The company sought joint-venture partners to develop a 5-MW geothermal plant and associated transmission lines at a cost of nearly $15 million (Business Council for Sustainable Energy, 2003, p. 112-114).

Tanzania had about 85,000 km of roads, of which approximately 4,000 km was paved. Only 14% of the unpaved roads was in good condition; the Government planned to rehabilitate 4,500 km of roads by 2004 (World Bank Group, 2001a). The rail network covered about 3,600 km. The country had 982 km of crude petroleum pipelines. Lake Nyasa, Lake Tanganyika, and Lake Victoria were the principal waterways. Ports and harbors were Bukoba, Dar es Salaam, Kigoma, Kilwa Masoko, Lindi, Mtwara, Mwanza, Pangani, Tanga, Wete, and Zanzibar.

Outlook

Tanzania's minerals industry, particularly gold mining, is likely to grow substantially in the near future. With increased production from the Bulyanhulu, Geita, and North Mara Mines and the development of such projects as Tulawaka, Tanzania's gold production is expected to rise to about 46 t in 2003, 54 t in 2005, and 57 t in 2007. Investments by Afgem and DeBeers are likely to lead to higher output of tanzanite and diamond; the outlook for these commodities also depends heavily upon world markets. The increases in diamond, gemstone, and gold production were likely to result in substantially higher mineral exports. The International Monetary Fund (2003, p. 180) predicted that Tanzania's GDP would grow by 5.5% in 2003 and 6.3% in 2004. If rates of growth are similar in the construction industry, then the production of construction materials, such as brick clay, gypsum, limestone, and sand and gravel, could increase substantially.

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TABLE 1

TANZANIA: PRODUCTION OF MINERAL COMMODITIES[1]

(Metric tons unless otherwise specified)

Commodity[2]		1998	1999	2000	2001	2002
Calcite[e]		40	40	40	40	40
Cement, hydraulic	thousand tons	778	833	833	900	1,026
Coal, bituminous		45,073	75,044	79,184	77,789	78,980
Copper, contained in concentrates and doré		--	--	--	2,645	2,700
Diamond[3]	carats	97,830	234,800	354,388	254,271	213,491
Gemstones, excluding diamond:[4]						
Amethyst[e]	kilograms	180	230	239 [5]	277 [5]	350
Aquamarine[e]	do.	140	200	205 [5]	454 [5]	590
Cordierite (Iolite)[e]	do.	120	155	158 [5]	312 [5]	400
Garnet[e]	do.	14,100	14,100	14,940 [5]	19,508 [5]	23,000
Ruby[e]	do.	1,000	1,000	1,070 [5]	1,174 [5]	1,500
Sapphire[e]	do.	2,450	2,500	2,531 [5]	3,576 [5]	4,200
Tanzanite	do.	1,226	5,216	5,516	5,473	4,800 [e]
Other[e]	do.	29,300	71,800	126,141 [5]	66,092 [5]	78,300
Total	do.	48,516	95,200	150,800	96,866	113,142
Gold	do.	427	4,890	15,060	30,088	37,000 [e]
Gypsum and anhydrite, crude		59,066	21,195	60,000	72,000	78,650
Limestone, crushed		1,181,233	1,241,155	1,500,000	2,269,359	1,542,000
Petroleum products		312,000	287,000	177,000 [r]	--	--
Phosphate minerals:						
Apatite		4,790	24,200	17,000	13,300	25,500
P_2O_5 content		1,437	7,250	5,100	4,000	7,650
Pozzolanic materials		--	2,274	57,014	41,468	43,268
Salt, all types		75,000	35,893	70,000	65,000	65,650
Sand, glass e/		4,200	--	--	--	--
Silver, contained in concentrates and doré	kilograms	--	276	1,384	6,861	8,620
Steel, semimanufactured		9,522	8,982 [r]	11,182	16,340 [r]	25,418

[e]Estimated; estimated data are rounded to no more than three significant digits. [r]Revised. -- Zero.

[1]Includes data available through February 9, 2004.

[2]In addition to the commodities listed, modest quantities of unlisted varieties of crude construction materials (other clays, sand and gravel, and stone) presumably are produced, but output is not reported quantitatively, and available information is inadequate to make reliable estimates of output levels.

[3]Diamond figures are estimated to represent 85% gem-quality or semigem-quality and 15% industrial-quality stones. Does not include smuggled artisanal production.

[4]Other precious and semiprecious stones produced included chrysoprase, emerald, peridot, and tourmaline.

[5]Reported figure.

TABLE 2
TANZANIA: STRUCTURE OF THE MINERALS INDUSTRY IN 2002

(Metric tons unless otherwise specified)

Commodity		Major operating companies	Location of main facilities	Annual capacity
Cement		Tanzania Portland Cement Co. Ltd. (HeidelbergCement, 41%)	Wazo Hill	500,000 cement; 800,000 clinker.
Do.		Tanga Cement Co. Ltd. (Holcim Ltd., 60%; Saruji Corp., 40%)	Tanga	500,000 cement; 500,000 clinker.
Do.		Mbeya Cement Co. Ltd. (LaFarge Group, 58%).	Mbeya	250,000 cement; 250,000 clinker.
Coal, bituminous		Tanzania-China Kiwira Coal and Power (Hunan International Economic and Technical Cooperation Co., 62%; Government, 38%)	Kiwira Mine	150,000 run of mine; 93,000 washed.
Copper, in concentrates		Kahama Mining Corp. Ltd. (Barrick Gold Corp., 100%).	Bulyanhulu Mine near Kahama	20,000 concentrate; 3,600 washed.
Diamond		Williamson Diamonds Ltd. (DeBeers Group, 75%; Government, 25%)	Mwadui Mine near Shinyanga	7,060,000 ore processing.
Do.	carats	do.	do.	300,000 diamond.
Gold		Anglogold Ltd., 50%; Ashanti Goldfields Co. Ltd., 50%	Geita Mine near Nyakabale	5,300,000 ore processing.
Do.	kilograms	do.	do.	22,300 gold.
Do.		Kahama Mining Corp. Ltd.	Bulyanhulu Mine near Kahama	1,095,000 ore processing.
Do.	kilograms	do.	do.	14,500 gold.
Do.		East African Gold Mines Ltd.	North Mara Mine	2,000,000 ore processing.
Do.	kilograms	do.	do.	7,400 gold.
Do.		Resolute Mining Ltd.	Golden Pride Mine near Isanga	2,600,000 ore processing.
Do.	kilograms	do.	do.	6,000 gold.
Petroleum products[1]	thousand barrels	Tanzanian & Italian Petoleum Refining Co. Ltd.	Dar es Salaam	5,440.
Phosphate rock		Minjingu Phosphate Co. Ltd.	Minjingu	30,000.
Steel		SITA Rollings Ltd.	Dar es Salaam	14,000 cold rolled.
Do.		Aluminum Africa Ltd.	Do.	40,000 galvanized.
Tanzanite		African Gem Resources Ltd.[2]	Merelani, Block C	52,000 ore processing.
Do.	carats	do.	do.	1,144,000 tanzanite.
Do.		Kilimanjaro Mines Ltd.	Merelani, Block A	NA.

NA Not available.

[1]Shut down in 2000.

[2]Formerly the graphite processing plant at Merelani operated by Phoenix Minerals Ltd.

TABLE 3
TANZANIA: GOLD RESOURCES AND RESERVES IN 2002

Project	Major operating companies	Tonnage (million metric tons)	Grade (grams per metric ton)	Contained gold (metric tons)
Reserves:				
Bulyanhulu[1]	Kahama Mining Corp. Ltd. (Barrick Gold Corp., 100%)	27.4	13.2	362
Geita [2]	Geita Gold Mines (Anglogold Ltd., 50%; and Ashanti Goldfields, 50%)	70.4	4.2	296
North Mara [2]	East African Gold Mines Ltd.	24.6	3.7	92
Golden Pride [2]	Resolute Mining Ltd.	13.1	2.3	31
Total		135.5	5.8	780
Resources:				
Bulyanhulu	Kahama Mining Corp. Ltd.	36.4	13.5 [3]	493
Geita	Geita Gold Mines	108.3	4.0	433
North Mara	East African Gold Mines Ltd.	44.5	3.0	135
Golden Pride	Resolute Mining Ltd.	27.1	2.2	60
Golden Ridge	Kahama Mining Corp. Ltd.	49	1.4	68
Chocolate Reef	do.	26	2.3	59
Tulawaka:				
East Zone	Barrick Gold Corp., 70%; and Exploration Minieres du Nord, 30%	1.7	14.2	24
West Zone	do.	0.7	2.9	2
Buhemba	Meremeta Ltd	11.4	2	23
Nyakafuru	Spinifex Gold Ltd.	3.6	6.3	23
Buckreef/Rwamagaza:				
Buckreef	do.	5.0	4.1	19
Bingwa and Tembo	do.	0.2	13.7	3
Kitongo:				
Main Zone	do.	10.5	1.4	15
Isegenghe Hill	do.	0.2	14.4	2
Kisunge Hill	Tan Range Exploration Corp.	9.4	1	9
Ikungu	Lakota Resources Inc.	2.6	2.3	6
Miyabi	African Eagle Resources plc	2.1	2.1	4
Total		339	4.1	1380

[1]Definitions of resources and reserves are based on National Instrument 43-101, as required by Canadian securities regulatory authorities.
[2]Definitions of resources and reserves are based on the Australasian Code for the Reporting of Identified Mineral Resources and Ore Reserves issued by the Joint Committee for the Australasian Institute of Geoscientists and the Australian Mining Industry Council.
[3]Note that in most cases, the grade of resources is lower than the grade for reserves, but in this case, the grade of the less economic material is higher, leading to the paradox of a higher resource grade.

Sources: African Eagle Resources plc, 2003; Ashanti Goldfields Co. Ltd., 2003; Barrick Gold Corp., 2003; Lion Selection Group Ltd., 2003; Mano River Resources Inc., 2004; Resolute Mining Ltd., 2002a; Resource Information Unit, 2001; Spinifex Gold Ltd., 2002a.